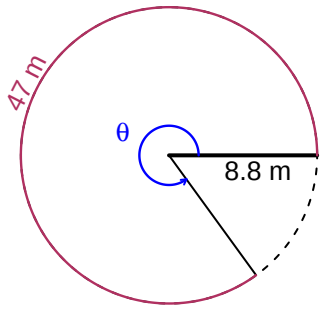
Name: Date:

Trig Final (SLTN v661)

- You can use a calculator (like Desmos)
- You should have a unit-circle with special angles and coordinates marked.

Question 1

In the figure below, we see a circle and a central angle that subtends an arc. The radius is 8.8 meters. The arc length is 47 meters. What is the angle measure in radians?

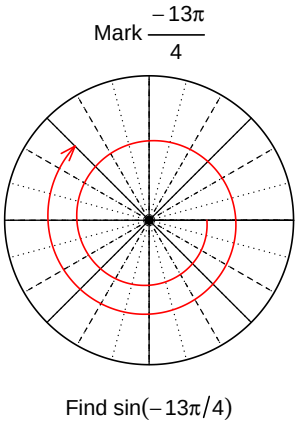


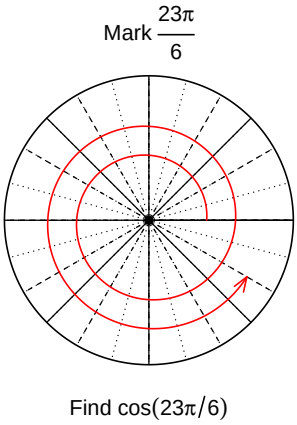
$$\theta = \frac{L}{r} \qquad r = \frac{L}{\theta} \qquad L = r\theta$$

$\theta = 5.341$ radians.

Question 2

Consider angles $\frac{-13\pi}{4}$ and $\frac{23\pi}{6}$. For each angle, use a spiral with an arrow head to **mark** the angle on a circle below in standard position. Then, find **exact** expressions for $\sin\left(\frac{-13\pi}{4}\right)$ and $\cos\left(\frac{23\pi}{6}\right)$ by using a unit circle (provided separately).





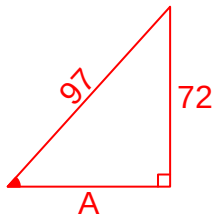
$\sin(-13\pi/4) = \frac{\sqrt{2}}{2}$

$\cos(23\pi/6) = \frac{\sqrt{3}}{2}$

Question 3

If $\sin(\theta) = \frac{72}{97}$, and θ is in quadrant II, determine an exact value for $\tan(\theta)$.

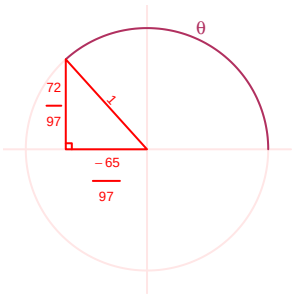
Ignore any negatives and the quadrant, and draw a right triangle (based on SOHCAHTOA) in standard (quadrant I) orientation.



Solve the Pythagorean Equation

$$A^2 + 72^2 = 97^2$$
$$A = \sqrt{97^2 - 72^2}$$
$$A = 65$$

Rescale the triangle so the hypotenuse is 1. Reflect the triangle into Quadrant II in a unit circle.



$$\tan(\theta) = \frac{\frac{72}{97}}{\frac{-65}{97}} = \frac{-72}{65}$$

Question 4

A mass-spring system oscillates vertically with an amplitude of 8 meters, a frequency of 3.04 Hz, and a midline at $y = 6.84$ meters. At $t = 0$, the mass is at the midline and moving down. Write an equation to model the height (y in meters) as a function of time (t in seconds).

Any of these equations would get full credit.

$$y = -8\sin(2\pi 3.04t) + 6.84$$

or

$$y = -8\sin(6.08\pi t) + 6.84$$

or

$$y = -8\sin(19.1t) + 6.84$$